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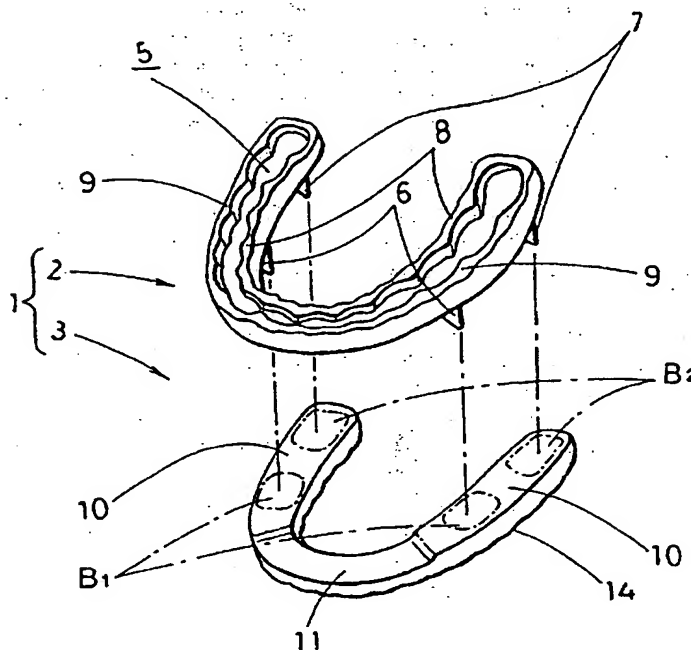
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(54) **MOUTHPIECE**

(57) A mouthpiece which has a simple structure, is therefore easy to machine for adjustment, and is extremely inexpensive. The mouthpiece comprises an upper piece to be fitted to the upper jaw dentition, and a lower piece vertically opposed to the upper piece and to be fitted to the lower jaw dentition. Projections are provided on the opposed surface of one of the upper and

lower pieces and project toward the other piece, and a supporting surface for supporting the projections when it comes in contact therewith. An upper dentition fitting groove for fitting the upper piece to the upper-jaw dentition is formed in the upper surface of the upper piece, and a lower dentition fitting groove for fitting the lower piece to the lower-jaw dentition is formed in the lower surface of the lower piece.

Fig. 3



Description

Technical Field

[0001] The present invention relates to a mouthpiece used to equally stretch lower jaw supporting muscles at right and left sides thereof by bite raising means, so as to correct one's posture.

Background Art

[0002] A general bone structure of and around the upper and lower jaws is illustrated in FIGS. 17(a) and 17(b).

[0003] Shown in FIG. 17(a) is an occlusion of rows of teeth when the upper and lower jaws are closed. In FIG. 17(a), there are shown the skull supported on the first cervical vertebrae 25 at the top end of the spine and the upper row of teeth 22 arranged in the upper jaw 20 of a front part of the skull. The lower jaw 21 having the row of teeth 23 on the lower jaw side is complicatedly supported by various muscles including a masseteric muscle. One naturally takes such a posture that one's head can be kept in the state in which the occlusion plane indicated by an axis X is aligned with an ideal occlusion plane (an approximately level plane). It is desirable that an axis Y perpendicular to the axis X extends along a vertical line.

[0004] It is known that the lower jaw 21 moves vertically around and further swings back and forth and from side to side in a three-dimensional manner around a median atlantoaxial joint T_0 between the first cervical vertebrae 25 and the second cervical vertebrae 26, not around a point J of a temporomandibular joint 24, as shown in FIG. 17(b).

[0005] When occlusion surfaces of the teeth wear with age, for example, so that the vertical occlusal height of the opposing upper and lower rows of teeth decreases, or "the dental bite goes low", as a whole, the upper jaw 20 comes to try to go to meet the lower jaw 21 and, as a result of this, the head leans forward. This causes the first cervical vertebrae 25 and the second cervical vertebrae 26 to move away forwardly from their ideal positions, so that they come into a straight bar-like form. Along with this out-of-position of the cervical vertebrae, the entire spinal cords are caused to hunch, then leading to a possible hunchback and further causing a possible lower back problem.

[0006] On the other hand, when the vertical occlusal height is decreased at either lateral end due to a significant partial bite, an unattended dental care after extraction of a tooth, or an excessive grinding of a carious tooth in the dental care, in other words, when an axis Z perpendicular to the both axes of X and Y (a horizontally extending axis, not shown) is slanted, muscle spindles of the lower mandibular raising muscles of the lower jaw are loosened. The information is transmitted to the brain through trigeminal nerves, to give a strong stress to the

brain. In response to the information, the brain automatically signals central orders to shorten the muscle spindles. Based on the orders, the mandibular raising muscles of the lower jaw at rest are reset to be shorter and also the entire skeletal muscles of the body on the same side are reset to be shorter. Those orders keep on being issued day and night, so that the brain and muscles fatigue chronically, then causing possible deterioration of the function of the brain and body.

[0007] Then, the neck is slanted to a lower vertical occlusal height, while on the other hand, the muscles of the shoulder on the opposite side increase in tension, in order to try to prevent the slant of the neck. It is known that this muscular contraction and tension puts the vertebral artery and vertebral nerve under stress, to induce discomfort complaints, such as stiffness of shoulder, vertigo, buzzing, headache, tinnitus and visceral disturbance, and autonomic imbalance.

[0008] To improve the partial muscular stretch and tension caused by the lowering of the vertical occlusal height could attain alleviation of a disease caused by deterioration of the function of the brain and improvements of athletic talents typified by one's reflexes and dexterity, of physical capabilities typified by muscle strength and muscular balance of the entire body, and of learning ability, thinking ability and concentration power.

[0009] In this connection, it is observed that a weightlifter having a horizontally deviated vertical occlusal height lifts a weight in the state in which its lower vertical occlusal height end is inclined downward. In U.S.A., it is compulsory for American football players to have bite raising mouthpieces on in the game, in order to prevent disabled caused by the muscular tension.

[0010] There has been proposed a mouthpiece used to straighten one's back to correct the one's posture, as disclosed by Japanese Utility Model Publication No. Sho 62-14833.

[0011] This proposed mouthpiece is designed to be fitted to either the row of teeth at the upper jaw side or the row of teeth at the lower jaw side. It comprises a first tooth row fitting piece to be fitted to the row of teeth located on one side from the median line, a second tooth row fitting piece to be fitted to the row of teeth located on the other side from the median line, and an arcuate connecting portion for connecting the pair of tooth row fitting pieces. In this mouthpiece, a plane perpendicular to a tooth axis of an opposing tooth (a shearing drag surface) is formed on a supporting surface of each of the tooth row fitting pieces by grinding for each opposing tooth.

[0012] In the mouthpiece disclosed by the publication above, it is necessary to grind and polish the shearing drag surface in a skillful manner in agreement with a teeth alignment on the non-fitting side, a moving range of intercuspal occlusal position on the lingual side and a vertical occlusal height. For example, the shearing drag surface must be adjusted for fitness to each of the

four back teeth at opposite ends of the rows of teeth and, besides, since the lower jaw must be moved so smoothly that one cannot feel any stress, a considerable skillfulness is required for the adjustment. It takes about 1-2 hours to do the dental treatment for each adjustment for fitness. Thus, the prior art has the problems that to say nothing of the labor of the dentist, the medical and technical service fee comes expensive.

[0013] In the light of the above-noted problems of the prior art, the present invention has been made. It is an object of the present invention to provide a mouthpiece of a simplified structure to facilitate an adjustment process for dental fitness and of significantly low in price.

Disclosure of the Invention

[0014] To accomplish the object mentioned above, a mouthpiece according to the present invention comprises an upper piece to be fitted to a row of teeth on an upper jaw side and a lower piece to be fitted to a row of teeth on a lower jaw side used in a vertically confronting relation with the upper piece, wherein one of an opposing surface of the upper piece and an opposing surface of the lower piece has at least two projections projecting toward the other piece and the other opposing surface has a supporting surface formed to support the at least two projections in abutment relation with them.

[0015] Each of the projections comprises a projecting piece formed separately from the one opposing surface and movable toward the other piece, projection height adjusting means for guiding the projecting piece toward the other piece to vary a height of the projection from the one opposing surface to a tip of the projecting piece, and projecting piece fixing means for fixing the projecting piece to the one opposing surface at a height of the projection set by the projection height adjusting means.

[0016] In the constitution mentioned above, the projection height adjusting means comprises a first sliding surface formed on the projecting piece and a second sliding surface formed on the one opposing surface to slide over the first sliding surface of the projecting piece, so as to guide the projecting piece toward the other piece.

[0017] Further, in the constitution mentioned above, the projection height adjusting means and the projecting piece fixing means comprise a first threaded portion provided on the projecting piece and a second threaded portion provided on the one opposing surface to be threadedly engaged with the first threaded portion of the projecting piece, respectively.

[0018] In any of the constitutions mentioned above, an upper tooth row fitting groove to be fitted to the row of teeth on the upper jaw side is formed on a top surface of the upper piece and a lower tooth row fitting groove to be fitted to the row of teeth on the lower jaw side is formed on a bottom surface of the lower piece, the upper piece and the lower piece being supported to the row of teeth on the upper jaw side and the row of teeth on the

lower jaw side, respectively, via soft lining material filled in the upper tooth row fitting groove and the lower tooth row fitting groove.

Brief Description of the Drawings

[0019]

FIG. 1 is a plan view of a mouthpiece according to one embodiment of the invention;

FIG. 2 is a bottom view of the same;

FIG. 3 is a perspective view of the same;

FIG. 4 is a front view of the same;

FIG. 5 illustrates the back of a patient fitting the mouthpiece on as taken by a moiré topography; FIG. 5(a) is an illustration showing the state of the back of the patient before fitting the mouthpiece on; and FIG. 5(b) is an illustration showing the state of the back of the patient after fitting the mouthpiece on for about 1 month;

FIG. 6 is an illustration of the state in which the mouthpieces are fitted to the upper and lower rows of teeth when viewed from side elevation;

FIG. 7 illustrates in section inclination of a shearing drag surface formed on a top surface of a lower piece of the mouthpiece by processing; FIG. 7(a) is an illustration of a type 1 occlusion; FIG. 7(b) is an illustration of a type 2 occlusion; and FIG. 7(c) is an illustration of a type 3 occlusion;

FIG. 8 is an illustration showing in section a mouthpiece according to another embodiment of the invention;

FIG. 9 is an illustration showing in section a mouthpiece according to still another embodiment of the invention;

FIG. 10 is a front view of a mouthpiece according to a further embodiment of the invention;

FIG. 11 is a bottom view showing a mouthpiece according to a still further embodiment of the invention;

FIG. 12 is an outline view of a principal part of a projection of a variant;

FIG. 13 is a partly sectioned view of the projection of the variant;

FIG. 14 illustrates the way of adjustment in length of the projection of the variant; FIG. 14(a) is an illustration showing the state in which one of the projections is in contact with the opposing surface but the other is not in contact with the same; and FIG. 14(b) is an illustration showing the state in which the both projections are in contact with their respective opposing surfaces;

FIG. 15 is a partly sectioned view of a projection of another variant;

FIG. 16 is a partly sectioned view of a projection of still another variant; and

FIG. 17 illustrates a general bone structure of and around the upper and lower jaws as viewed from

th side elevation, FIG. 17(a) is an illustration of the occlusion of the upper and lower rows of teeth; and FIG. 17(b) is an illustration of the state in which the lower jaw is opened.

B st Mode for Carrying out the Invention

[0020] In the following, preferred embodiments of the present invention will be described with reference to the accompanying drawings.

[0021] FIG. 1 is a plan view of a mouthpiece according to one embodiment of the invention; FIG. 2 is a bottom view of the same; FIG. 3 is a perspective view of the same; and FIG. 4 is a front view of the same.

[0022] In the respective diagrams, the mouthpiece 1 of this embodiment comprises combination of an upper piece 2 to be fitted to a row of teeth on an upper jaw side and a lower piece 3 to be fitted to a row of teeth on a lower jaw side used in a vertically confronting relation with the upper piece 2. The upper piece 2 and the lower piece 3 are made, for example, of methyl methacrylate resin for dental use and are formed into a general horse-shoe arch form to fitted to all upper and lower teeth, when viewed from the top.

[0023] The upper piece 2 has, on its opposing surface (bottom surface) 4, four conical projections 6, 6, 7, 7 projecting therefrom toward the lower piece 3. The upper piece 2 has, in its top surface, an upper tooth row fitting groove 5 surrounded by its inner and outer edges 8 and 9.

[0024] The lower piece 3 has, on its opposing surface, supporting surfaces 10, 10 for resting and supporting the projections 6, 6, 7, 7 thereon. The lower piece 3 has, in its bottom surface, a lower tooth row fitting groove 12 surrounded by its inner and outer edges 13 and 14.

[0025] The supporting surfaces 10, 10 of the lower piece 3 are integrally connected to each other through a depressed thin sheet portion 11. Processed surfaces B_1 , B_2 to be subjected to cutting out adequate shearing drag surfaces for the projections 6, 6, 7, 7 are set on the supporting surfaces 10, 10 at locations thereof at which the projections 6, 6, 7, 7 are put in abutment with the supporting surfaces. Reference mark C in FIG. 4 represents a current body axis or median line of a patient.

[0026] Sequentially, the fitting and adjusting order of the mouthpiece 1 will be described.

[0027] First, a photograph of the back of the patient before fitting the mouthpiece on is taken by moiré topography, as shown in FIG. 5(a). The result of the moiré topography showing the undulation of the body surface in contour lines shows that the present body axis C of this patient is slanted rightward with respect to an ideal body axis C_0 . This indicates that the vertical occlusal height on the right-hand side is lower than that on the left-hand side. Then, the dentist checks the body axis C with reference to the photograph of the moiré topography, to make the patient's posture change, so as to bring the body axis C into coincidence with the ideal body axis

C_0 (vertical line). Based on the variation of the patient's posture on the right and left sides thereof, a required quantity of bite raising of the vertical occlusal height on the right and left sides is determined. In addition, the patient's back and forth posture is visually observed from the side of the body, for using it as part of the reference materials for determination of a total quantity of bite raising of the vertical occlusal height on the two rows of teeth.

[0028] Then, the patient's head is kept in the state in which the axis X indicating the occlusion plane of the row of teeth 22 on the upper jaw side is in a substantially horizontal position, as shown in FIG. 6. In this state, the upper tooth row fitting groove 5 to snugly fit to the row of teeth 22 on the upper jaw side is formed so that the opposing surface 4 of the upper piece 2 is in parallel to a nasoauditory meatus R connecting between a subnasal position and a lughole or a HIP plane S (a hamular notch-incisal-papilla plane) connecting between an incisive papilla at the back of anterior tooth and right and left hamular notches at the back of the molars. On the other hand, the lower tooth row fitting groove 12 to snugly fit to the row of teeth 23 on the lower jaw side is formed so that the occlusion plane of the row of teeth 23 on the lower jaw side is in substantially parallel to the supporting surfaces 10.

[0029] A group of muscles supporting the lower jaw 21 have practiced their mandibular movement in accordance with the horizontal difference in vertical occlusal height so far. So, when the patient fits the mouthpiece 1 at this time on, there appears inconformity in vertical occlusal height between the right and left sides. Then, the patient moves the lower jaw 21 so that the lip can be made bilaterally symmetrical, and the center line at the time is determined as the median line C (See FIG. 4).

[0030] Then, the projections 6, 7 are adjusted in length so that they can all be brought into contact with the supporting surfaces 10 simultaneously when the lower jaw 21 is opened at a predetermined angle corresponding to a required quantity of bite raising of the vertical occlusal height and also the mouthpiece 1 is occluded in the state in which the median line C is determined.

[0031] Then, the adjustment of the shearing drag surface on the supporting surfaces 10 will be described. In general, the adjustment of the shearing drag surface is performed in parallel with the adjustment of the length of the projections 6, 7, to have a good balance therebetween. For facilitation of understanding of the present invention, the description thereon will be given here separately.

[0032] First, consideration will be taken on a lateral movement path in the condition in which the projections 6, 7 of the upper piece 2 are all in contact with the supporting surfaces 10 of the lower piece 3. Here, the shearing drag surfaces perpendicular to the tooth axes of the opposing teeth are formed on the processed surfaces

B_1, B_2 at locations thereof to abut with the projections 6, 7.

[0033] The shearing drag surfaces are cut out one by one from the molar side to the premolar side for each separate projection 6, 7. If the adjoining shearing drag surfaces are not aligned with each other, in other words, if the adjoining shearing drag surfaces are different in inclination, then the boundaries between the both shearing drag surfaces are allowed to gently vary in inclination.

[0034] In this connection, in the type 1 occlusion wherein the lower jaw 21 and the upper jaw 20 are generally identical in size, shearing drag surfaces P_1, P_1 perpendicular to tooth axes A_1, A_1 connecting between the teeth on the upper jaw side and the teeth on the lower jaw side are often formed, as shown in FIG. 7(a). In this type 1 occlusion, since the supporting surfaces (P_1, P_1) which are originally on a level with each other and in one plane can be used as reference planes, the adjustment in length of the projections 6, 7 and the adjustment in inclination of the shearing drag surfaces can be made with comparative ease.

[0035] In the type 2 occlusion wherein the lower jaw 21 is smaller than the upper jaw 20, a shearing drag surface P_2 perpendicular to a tooth axis A_2 and a shearing drag surface P_3 perpendicular to a tooth axis A_3 are often formed, as shown in FIG. 7(b).

[0036] In the type 3 occlusion wherein the lower jaw 21 is larger than the upper jaw 20, a shearing drag surface P_4 perpendicular to a tooth axis A_4 and a shearing drag surface P_5 perpendicular to a tooth axis A_5 are often formed, as shown in FIG. 7(c).

[0037] For the patient of the occlusion corresponding to the type 2 occlusion or the type 3 occlusion (See FIG. 7(b) or FIG. 7(c)), an alternative may be taken wherein the opposing surfaces of the upper and lower pieces are formed into level planes, like the shearing drag surfaces P_1, P_1 , respectively, and also are widened laterally, and further the projections 6, 7 are formed to extend along the vertical axis, like the tooth axes of A_1 . This enables the adjustment in length of the projections 6, 7 and the adjustment in inclination of the shearing drag surfaces P_2-P_5 to be made with ease, as is the case with the mouthpiece easy for adjustment for the type 1 occlusion (See FIG. 7(a)).

[0038] The patient is prompted to fit the mouthpiece 1 thus adjusted for about one week for the time being. After fitting, the lower jaw 21 is forced to gradually shift in position in a three-dimensional manner by the mouthpiece, to thereby produce new axes X, Y and Z. In accordance with these new axes X, Y and Z, the projections 6, 7 are re-adjusted in length and also the processed surfaces B_1, B_2 of the supporting surfaces 10 are scraped to be adequately angled.

[0039] A series of operations comprising the check of the body axis C, the confirmation of the new axes X, Y and Z and the adjustment in length of the projections 6, 7 as well as in inclination of the supporting surfaces 10

are repeatedly carried out, in order to bring the body axis C at the time closer to the ideal body axis C_0 . It is preferable that thereafter, the same adjustments are carried out once every about one month.

[0040] The patient should preferably fit the thus adjusted mouthpiece 1 on for a period of about 6 months to about 12 months. Though it is ideal to fit the mouthpiece 1 on all day long, if it is difficult to do so, then the patient is prompted to fit it on for about 12 hours a day. It should be noted, however, that the patient should fit the mouthpiece on without fail for sleeping hours and on physical exercise. Due to this fitting, the groups of lower jaw supporting muscles of the both right and left sides gradually come to be substantially equal in length and thereby the patient's spine is straightened and his/her posture is corrected. Further, the muscles of the entire body of the both right and left sides gradually come to have and hold substantially equal length and strength and, as a result of this, indefinite complaints, function of the brain, athletic talents, physical capabilities, learning ability and the like are improved.

[0041] In this connection, the patient has fitted the mouthpiece 1 on for about 1 month, the result being that the body axis of the patient came approximately to the ideal body axis C_0 , as shown in FIG. 5(b).

[0042] According to the mouthpiece 1 of this embodiment of the invention, since the projections 6, 7 are each formed into the conical shape that gradually becomes smaller toward the tip, the projections 6, 7 can be adjusted in length with ease and, hence, the bite raising quantity of the vertical occlusal height can be adjusted with ease. In addition, since the projections 6, 7 are relatively small in number and also their tips are brought into nearly point contact with the supporting surfaces 10, areas of the supporting surfaces required for the shearing drag surfaces to be formed can be reduced and, thus, the adjustment process can be facilitated.

[0043] Thus, the mouthpiece 1 of this embodiment of the invention can eliminate the need of grinding the shearing drag surfaces separately for each tooth, differently from the prior art, and can save labor hour or high degree of skill for the process.

[0044] In the embodiment illustrated above, the upper tooth row fitting groove 5 and the lower tooth row fitting groove 12 are formed by the process that after the teeth patterns of the row of teeth 20 on the upper jaw side and the row of teeth 23 on the lower jaw side are taken and then transferred to the upper piece 2 and the lower piece 3, the both pieces are formed to have a size to snugly fit to the teeth by a finely grinding adjustment. The tooth row fitting grooves of the present invention are not limited to this configuration.

[0045] For example, as the mouthpiece 1a shown in FIG. 8, the tooth row fitting grooves of the upper piece 2a and the lower piece 3a may be formed to be slightly larger than the outlines of the rows of teeth, for rough fitness to the rows of teeth. In this mouthpiece 1a, the upper piece 2a is supported to the row of teeth 22 on

th upper jaw side through soft lining material 27 filled in the upper tooth row fitting groove of the upper piece 2a. The lower piece 3a is also supported to the row of teeth 23 on the lower jaw side through the soft lining material 27.

[0046] Thus, according to the mouthpiece 1a, after the commercially available soft lining material 27 (which is sometimes called denture stabilizing material) is filled in the tooth row fitting grooves, the both pieces are fitted to their respective rows of teeth. This can produce the result of saving labor hour and cost for the highly precise processing of the tooth row fitting grooves.

[0047] Further, the mouthpiece 1b may comprise the upper piece 2b and the lower piece 3b having their respective tooth row fitting grooves which are formed into simple straight-sided grooves, as shown in FIG. 9. In this mouthpiece 1b also, the upper piece 2b and the lower piece 3b are fitted to the row of teeth 21 on the upper jaw side and the row of teeth 22 on the lower jaw side with ease and are held thereto through the soft lining material 27. For the dental clinic, there is only a need to grind the shearing drag surfaces only at four locations thereof to contact with the projections 6, 7, for fitting adjustment, and there is no need to process the tooth row fitting grooves by grinding. Hence, this mouthpiece can provide the advantage of being useable immediately, thus saving the labor hour and cost for the process to a large extent. This may shed light on a patient who suffers from indefinite complaints caused by poor occlusion but partly gives up the dental treatment because of the high cost medical care.

[0048] The upper piece and the lower piece of the embodiments illustrated above may be modified to be replaced with each other, as shown in FIG. 10. Specifically, in the mouthpiece 1c, the lower piece 2c is provided with the upward projections 6, 6, 7, 7 and the upper piece 3c is provided with the supporting surfaces 10, 10 at a bottom thereof. This mouthpiece 1c can also provide the same effect as the mouthpieces 1-1b mentioned above.

[0049] While examples of the mouthpiece to be fitted to all teeth were shown in the embodiments illustrated above, the mouthpiece 1d may comprise an upper piece 2d comprising upper tooth row fitting pieces 16, 16 to be fitted to the premolars and molars only and a connector 18 for connecting between the upper row fitting pieces 16, 16 and a lower piece 3d comprising lower tooth row fitting pieces 17, 17 to be fitted to the premolars and molars only and a connector 18 for connecting between the lower row fitting pieces 17, 17, as shown in FIG. 11.

[0050] In this type of mouthpiece also, the upper tooth row fitting groove 5a and the lower tooth row fitting groove 12a are not limited to the ones formed in a tooth pattern and ground to snugly fit to the teeth, but may be formed into a rough groove form, for use in combination with the soft lining material 27 (See FIGS. 8 and 9).

[0051] Also, while examples of the mouthpiece 1-1d

provided with the four projections were shown in the embodiments illustrated above, the present invention is not limited to this configuration. It is enough for the mouthpiece to have at least two projections. When an increased number of projections are provided on one of the two pieces, the corresponding number of shearing drag surfaces must be prepared on the opposing surface of the other piece. If fourteen projections are provided on the one piece, then the same number of shearing drag surfaces must be formed on the other piece, but, since spaces or openings are formed between the projections, the process for fitness can be made with considerable ease. The projections of the invention are not limited to the conical configuration illustrated above. Any other configurations may be adopted for the projections, including, for example, column-shaped, elliptic-cylinder-shaped, rectangular-column-shaped, and pyramid-shaped.

[0052] Referring now to FIGS. 12 and 13, there is shown another example of the projections. In FIGS. 12 and 13, the projections 7a of this mouthpiece each comprise a projecting piece 31 formed separately from the opposing surface 4 of the lower piece 2e and a projection height adjusting means 34 for guiding the projecting piece 31 toward the upper piece 3e to vary the height H of the projection from the opposing surface 4 to the tip 31a.

[0053] The projection height adjusting means 34 comprises a first sliding surface 33 formed by an inner surface of a vertical hole formed in the projecting piece 31 and a second sliding surface 32 formed by an outer surface of a pin 30 standing from the opposing surface 4. In detail, the first sliding surface 33 of the projecting piece 31 is so formed that the projecting piece 31 can slide over the second sliding surface 32 of the pin 30 toward the upper piece 3e (See FIG. 14).

[0054] When the projection 7a thus constructed is adjusted to an adequate length, one projecting piece 31 (the one depicted at the left side as viewed in the diagram) is first fixed to the pin 30 by adhesive R at a position corresponding to an adequate height of the projection, as shown in FIG. 14(a). The other projecting piece 31 (the one depicted at the right side as viewed in the diagram) is loosely fitted to the pin 30 so that it can freely slide vertically.

[0055] Then, when the upper piece 3e is moved close to the lower piece 2e (in the direction indicated by an arrow 35 in the diagram), the tip of the projecting piece 31 at the right side comes into abutment with the opposing surface 10 of the upper piece 3e, first. At this time, a clearance L is formed between the tip of the projecting piece 31 at the left side and the opposing surface 10 of the upper piece 3e.

[0056] When the upper piece 3e is continuously moved further in the arrow 36 direction, as shown in FIG. 14(b), the projecting piece 31 at the right side is pressed down, while the first sliding surface 33 is slid over the second sliding surface 32, so that the pin 30 goes into

the vertical hole of the projecting piece 31. Then, the tip of the projecting piece 31 at the left side is soon brought into abutment with the opposing surface 10 of the upper piece 3e.

[0057] At this point of time, the both projecting pieces 7a, 7a are brought into contact with the supporting surfaces 10, 10, whereat the projecting piece 31 at the right side is fixed to the pin 30 by means of adhesive Ra (which is an example of the projecting piece fixing means). This can eliminate the need of grinding the tip of the projections 6, 7, thus further facilitating the adjustment of the projection 7a to an adequate length.

[0058] Referring further to FIG. 15, there is shown a principal part of another example of the lower piece. The projection 7b of FIG. 15 comprises a projecting piece 38 with a vertical hole having in its inner surface a first threaded portion 40 (female screw in this example) and a pin 37 standing from the opposing surface 4 side and having in its outer surface a second threaded portion 39 (male screw in this example) threadedly engageable with the first threaded portion 40.

[0059] According to this projection 7b, the height H of the projection from the opposing surface 4 to the tip 38a of the projecting piece 38 can be varied by screwing forward the projecting piece 38 with fingers. When the projection 7c is stopped screwing with the fingers, the projection 7c is fixed to the pin 37 on the opposing surface 4 side at that position. Thus, the projection height adjusting means 34a (one example of the projection height adjusting means and projecting piece fixing means as defined by the present invention) comprises the first threaded portion 40 and the second threaded portion 39. Thus, the combination of the first threaded portion 40 and the second threaded portion 39 can provide the combined function of the projection height adjusting means and the projecting piece fixing means of the present invention.

[0060] Referring now to FIG. 16, there is shown a principal part of still another example of the lower piece. The projection 7c of FIG. 16 is formed into a pin-like form and has a first threaded portion 41 of a male screw thereon. On the other hand, the lower piece 2e is provided, on its opposing surface 4, with a second threaded portion 42 of a female screw threadedly engageable with the first threaded portion 41.

[0061] In this example also, the height H of the projection from the opposing surface 4 to the tip of the projection 7c can be varied by screwing forward the projection 7c with fingers. When the projection 7c is stopped screwing with the fingers, the projection 7c is fixed to the pin 37 on the opposing surface 4 side at that position. Thus, the projection height adjusting means 34b (another example of the projection height adjusting means and projecting piece fixing means as defined by the present invention) comprises the first threaded portion 41 and the second threaded portion 42.

[0062] After the adjustment of the height H of the projection, an end portion 7d of the projection 7c that was

no longer required can be cut off easily with a nipper and the like.

Capabilities of Explanation in Industry

[0063] According to the mouthpiece according to the present invention, since the projections of the one piece are brought into abutment with the supporting surfaces of the other piece and supported thereon, as mentioned above, the heights of the projections can be adjusted by filing off the projections with a dental file and the like or extending them. Thus, the bite raising quantity of the vertical occlusal height can be adjusted easily with just a little process. Hence, the dental treatment in the dental clinic can be simplified and thus finished in a matter of minutes. In addition, since the abutment condition between the projections and their related surfaces can be confirmed visibly through the openings between the projections, the adjustment in height of the projections and in inclination of the shearing drag surfaces can be made with accuracy. Further, since the tips of the projections are brought into nearly point contact with the supporting surfaces, the patient can move his/her lower jaw with ease in the occlusal state, thus giving adequate play to the masseteric muscles.

[0064] In summary, the mouthpiece of the present invention can provide not only the result of equally stretching the lower jaw supporting muscles at right and left sides thereof by bite raising means, to correct one's posture, but also the results of being simplified in structure to facilitate an adjustment process for dental fitness and being provided at a significantly low price. Even for the mouthpiece designed for the patient of the occlusion corresponding to the type 2 occlusion or the type 3 occlusion, the adjustment in length of the projections and the adjustment in inclination of the shearing drag surfaces can be made easily, as is the mouthpiece easy for adjustment for the type 1 occlusion, by modifications of the opposing surfaces of the upper and lower pieces being widened laterally and formed into level planes and of the projections being formed to extend along the vertical axis.

[0065] Also, the projections comprising the projecting pieces, the projection height adjusting means for varying the height of the projection and the projecting piece fixing means for fixing the projecting pieces to one opposing surfaces can produce the result of adjusting the projections to adequate heights with a significantly simple operation.

[0066] Further, the projections adapted to be used in combination with the soft lining material can provide the advantage that the tooth row fitting grooves can be ground out to have a rough form somewhat larger than the row of teeth, thus eliminating the need of the highly precise processing of the tooth row fitting grooves. The adjustment of the vertical occlusal height can be made simply by grinding the projections a little bit, for fine adjustment, and adjusting an amount of soft lining material

to be filled in the grooves. Thus, the mouthpiece of significantly low price and simple and easy constitution can be provided.

Claims

1. A mouthpiece comprising an upper piece to be fitted to a row of teeth on an upper jaw side and a lower piece to be fitted to a row of teeth on a lower jaw side used in a vertically confronting relation with the upper piece, wherein one of an opposing surface of the upper piece and an opposing surface of the lower piece has at least two projections projecting toward the other piece and the other opposing surface has a supporting surface formed to support the at least two projections in abutment relation with them.
2. The mouthpiece according to Claim 1, wherein each of the projections comprises a projecting piece formed separately from the one opposing surface and movable toward the other piece, projection height adjusting means for guiding the projecting piece toward the other piece to vary a height of the projection from the one opposing surface to a tip of the projecting piece, and projecting piece fixing means for fixing the projecting piece to the one opposing surface at a height of the projection set by the projection height adjusting means.
3. The mouthpiece according to Claim 2, wherein the projection height adjusting means comprises a first sliding surface formed on the projecting piece and a second sliding surface formed on the one opposing surface to slide over the first sliding surface of the projecting piece, so as to guide the projecting piece toward the other piece.
4. The mouthpiece according to Claim 2, wherein the projection height adjusting means and the projecting piece fixing means comprise a first threaded portion provided on the projecting piece and a second threaded portion provided on the one opposing surface to be threadedly engaged with the first threaded portion of the projecting piece, respectively.
5. The mouthpiece according to any one of Claims 1 through 4, wherein an upper tooth row fitting groove to be fitted to the row of teeth on the upper jaw side is formed on a top surface of the upper piece and a lower tooth row fitting groove to be fitted to the row of teeth on the lower jaw side is formed on a bottom surface of the lower piece, the upper piece and the lower piece being supported to the row of teeth on the upper jaw side and the row of teeth on the lower jaw side, respectively, via soft lining material filled in the upper tooth row fitting groove and the lower

tooth row fitting groove.

Fig. 1

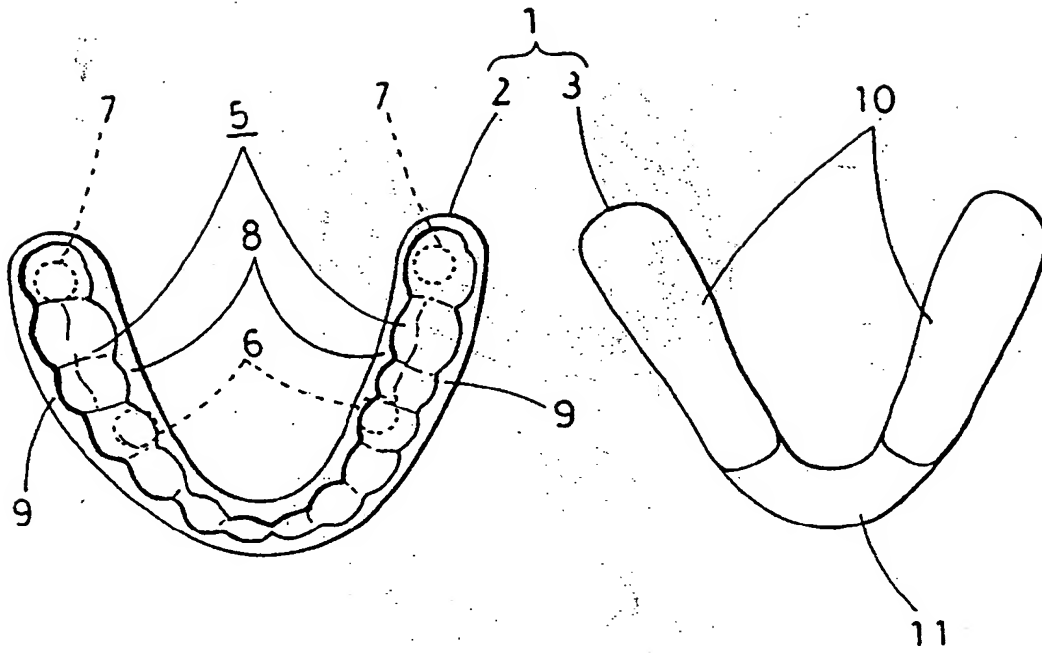


Fig. 2

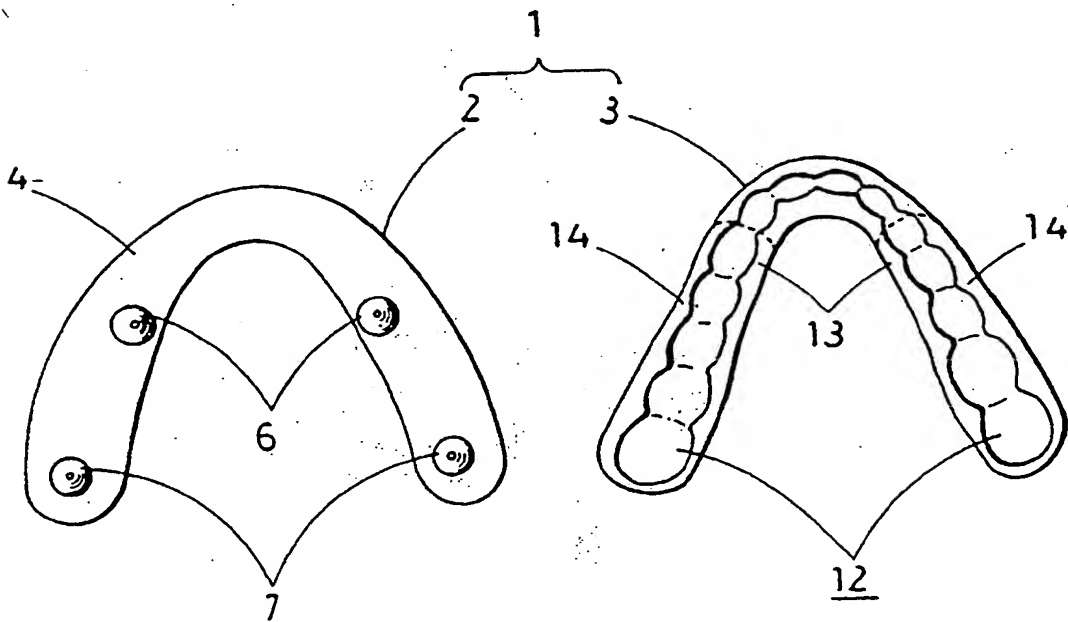


Fig. 3

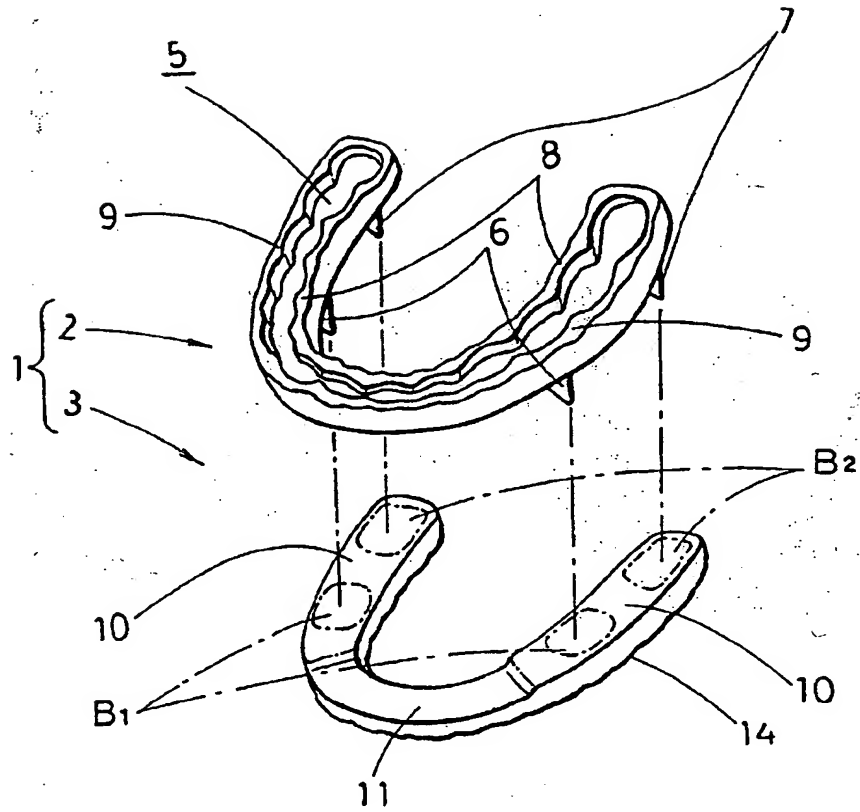


Fig. 4

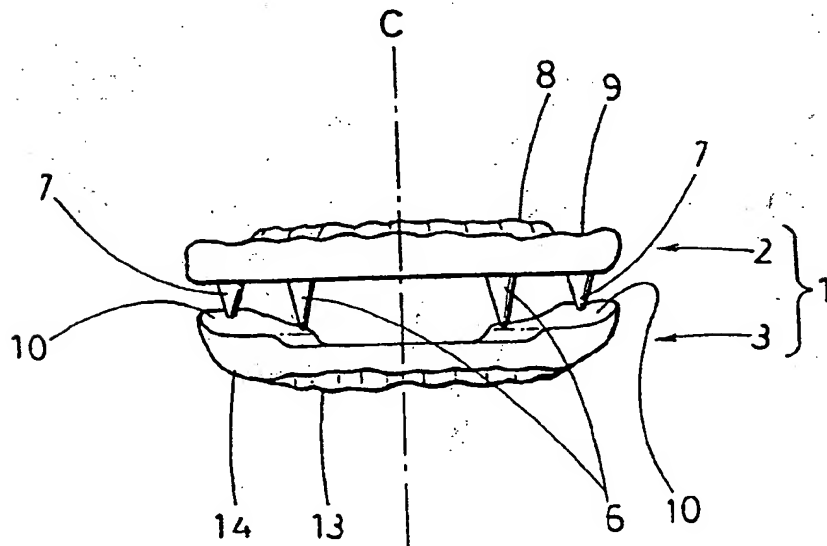


Fig.5(a)

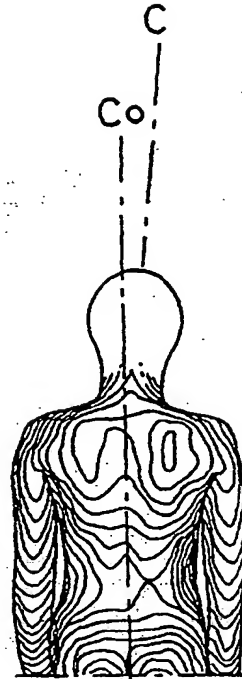


Fig.5(b)

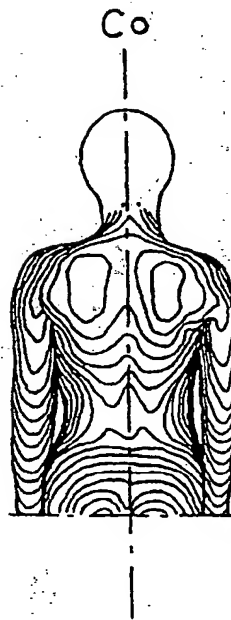


Fig.6

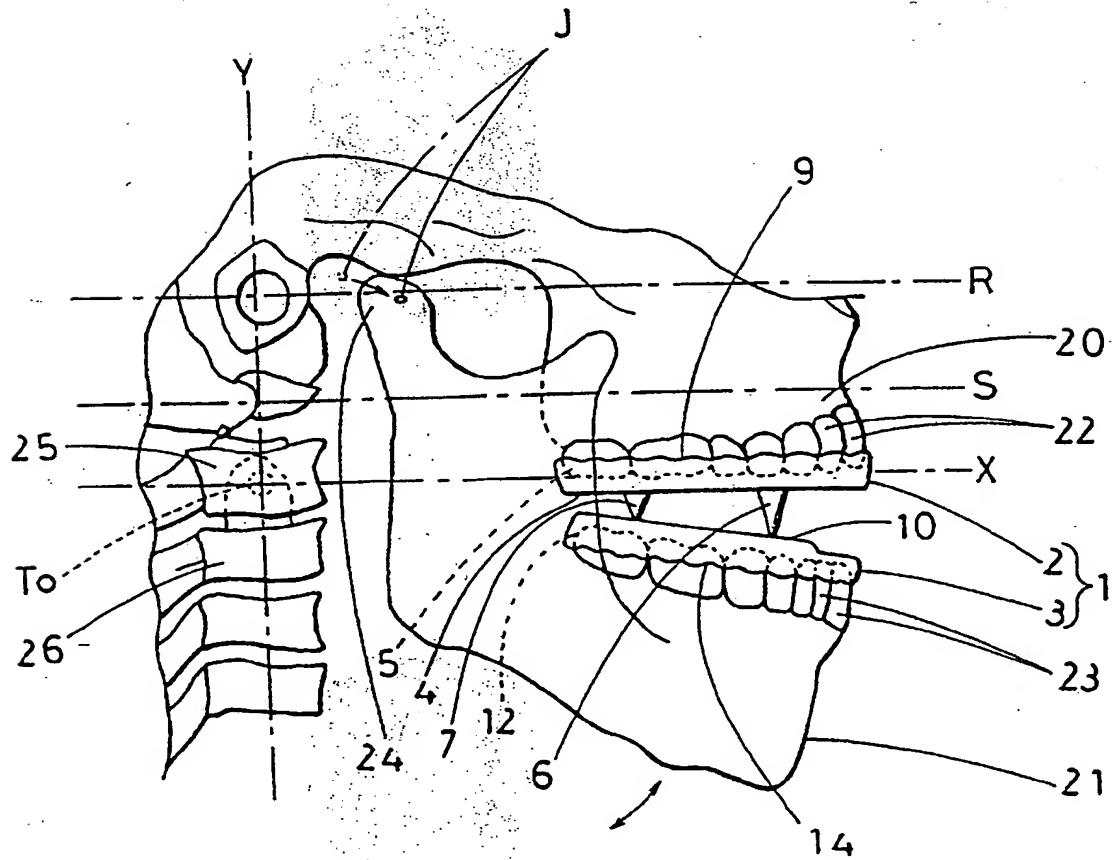


Fig.7(a)

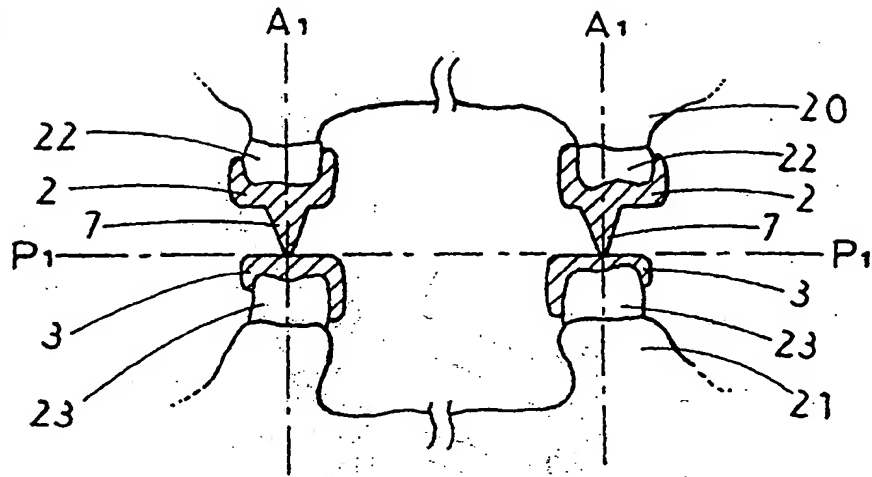


Fig.7(b)

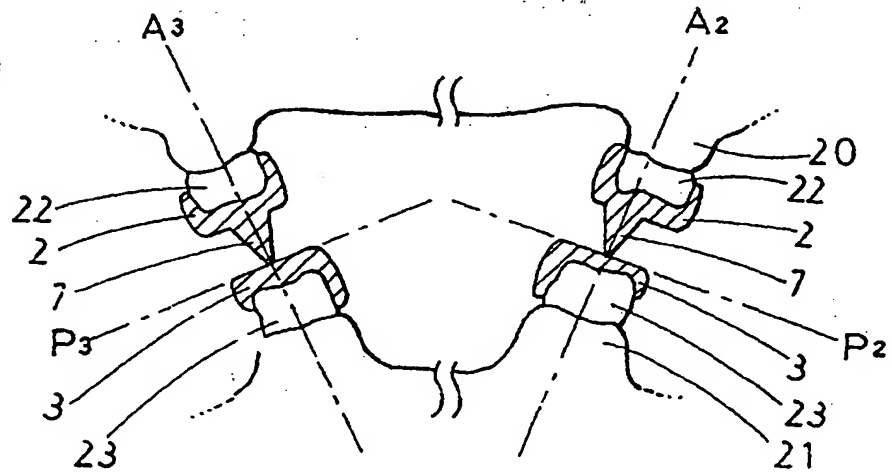


Fig.7(c)

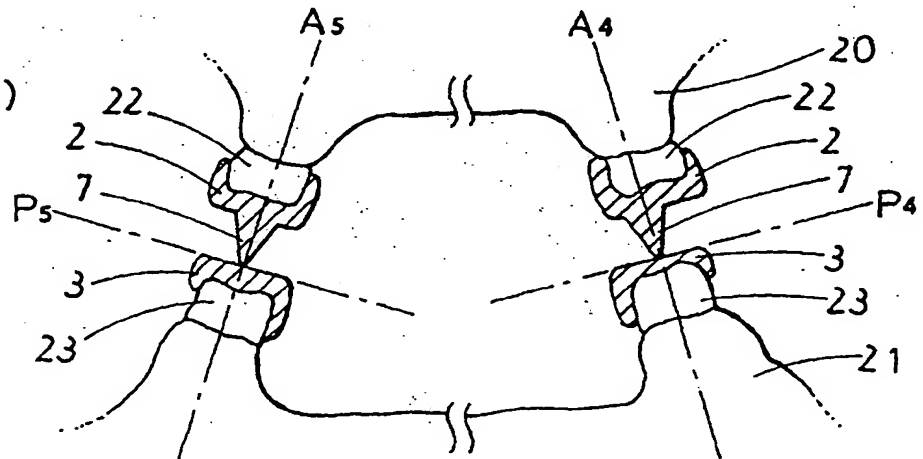


Fig. 8

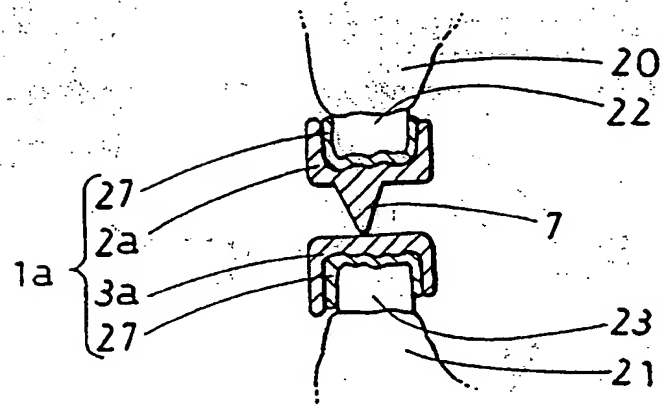


Fig. 9

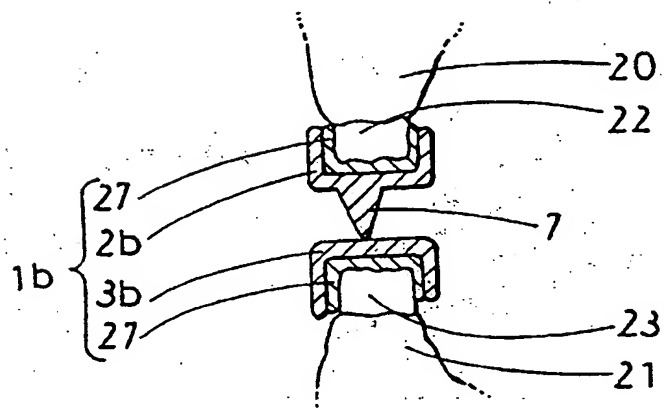


Fig. 10

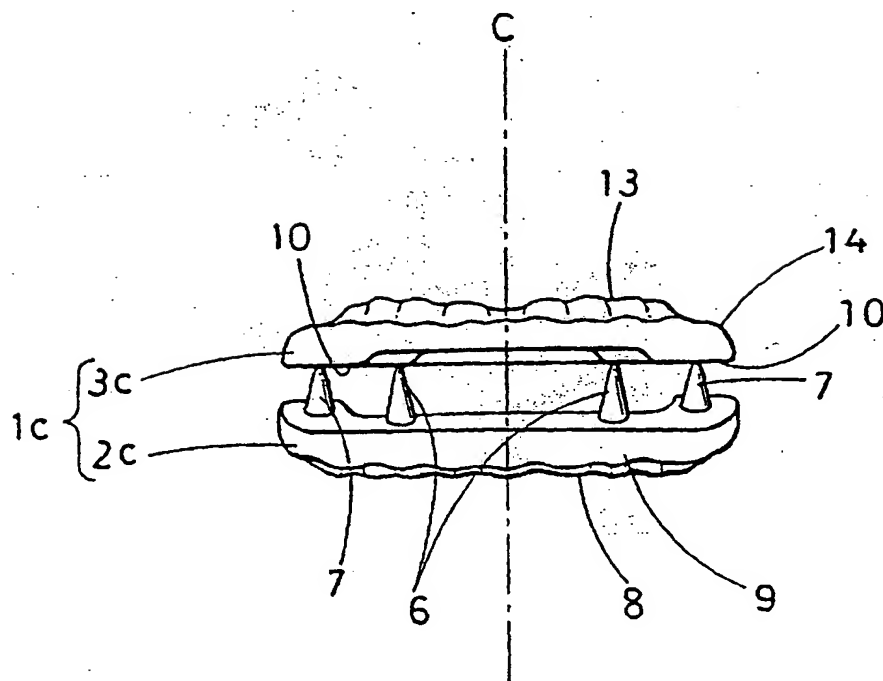


Fig. 11

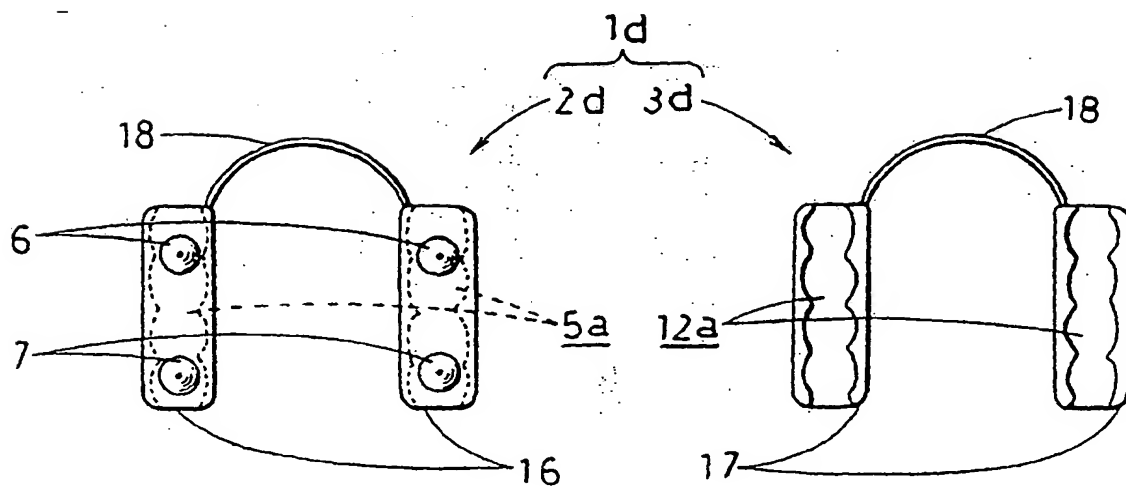


Fig. 12

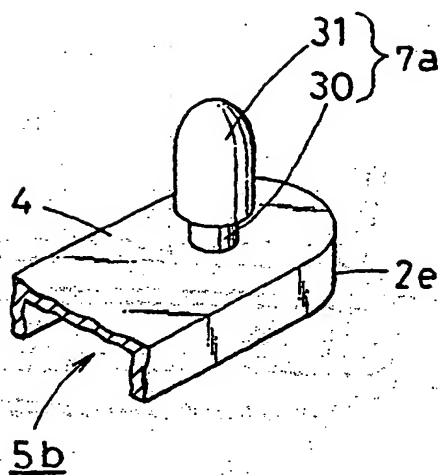


Fig. 13

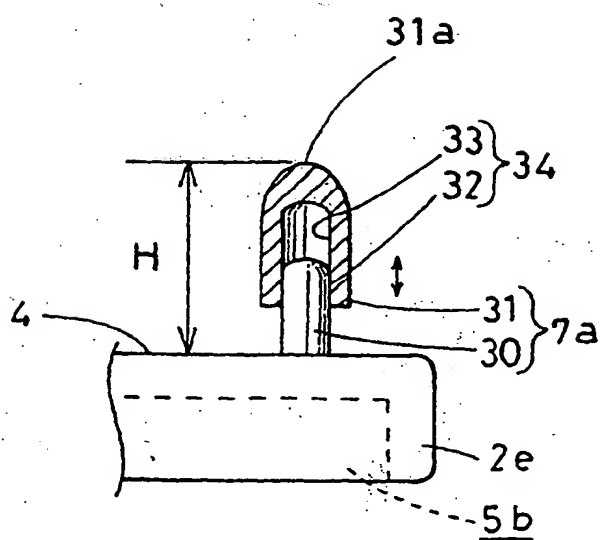


Fig.14(a)

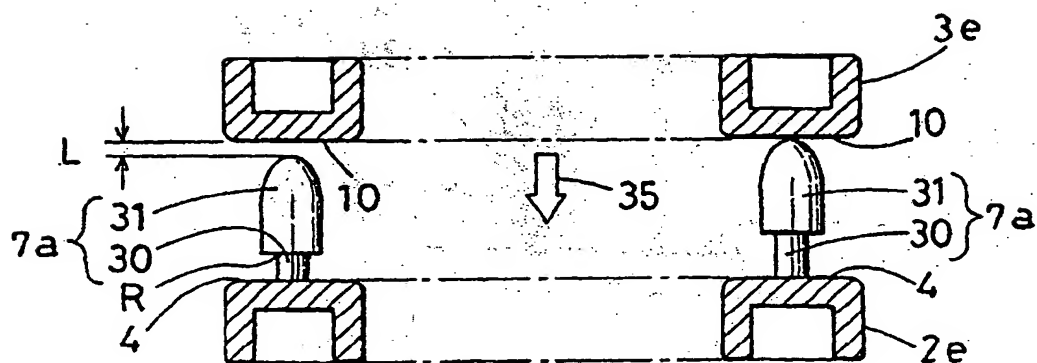


Fig.14(b)

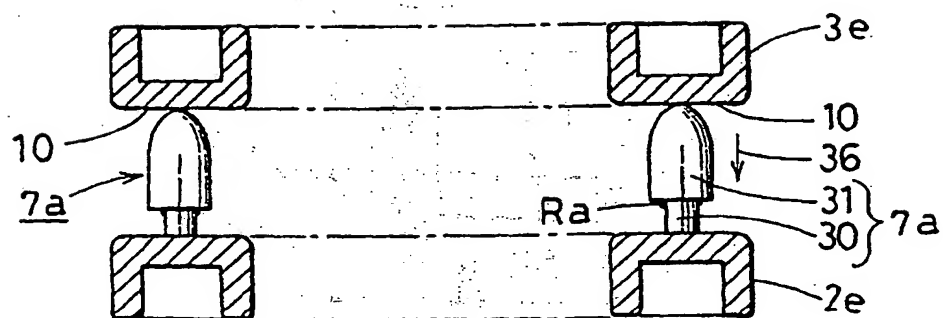


Fig. 15

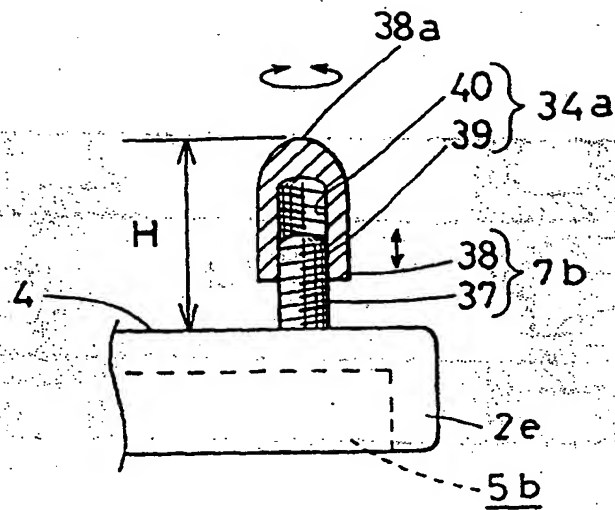


Fig. 16

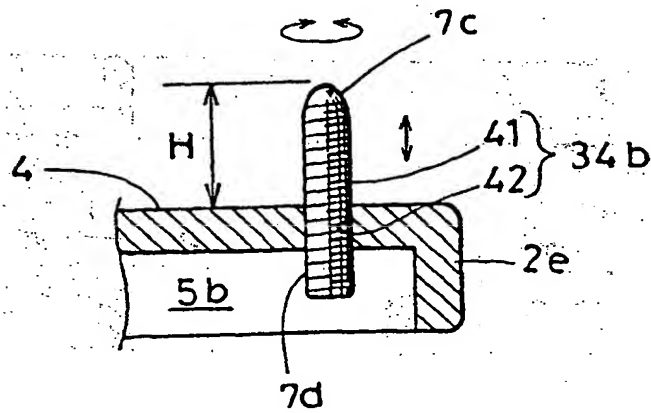


Fig.17(a)

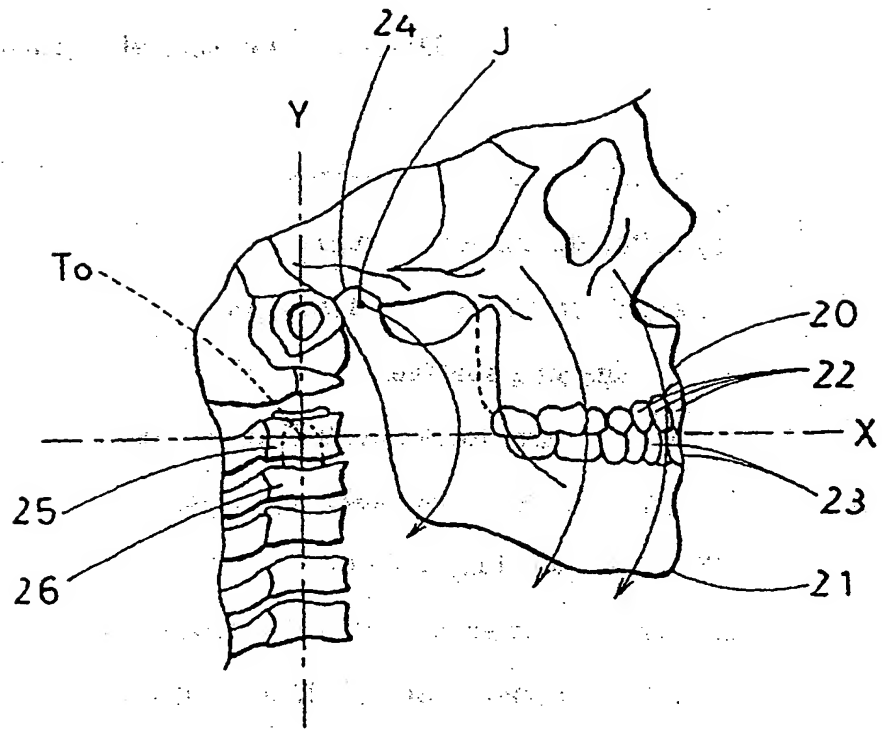
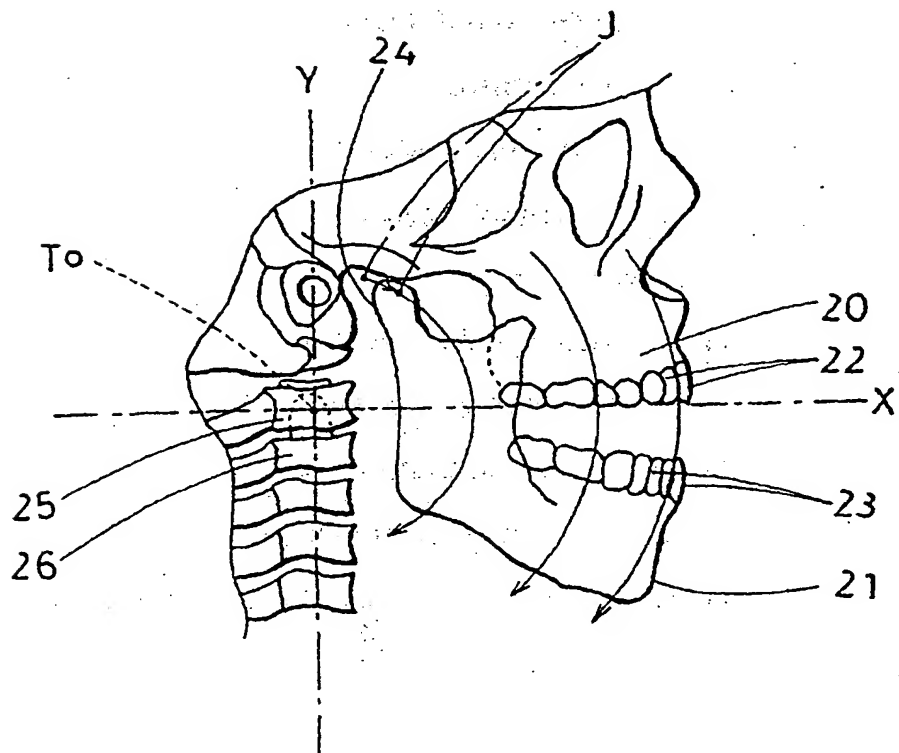


Fig.17(b)



Description of the reference numbers

1, 1a, 1b, 1c, 1d	mouthpiece
2, 2a, 2b, 2d, 3c, 3e	upper piece
3, 3a, 3b, 3d, 2c, 2e	lower piece
4	opposing surface
5, 5a	upper tooth row fitting groove
6, 7, 7a, 7b, 7c	conical projection
10	supporting surfaces
12, 12a	lower tooth row fitting groove
16, 17	upper tooth row fitting pieces
18	connector
22	upper row of teeth
23	row of teeth
27	soft lining material
31, 38	projecting piece
31a, 38a	tip
32	second sliding surface
33	first sliding surface
39, 42	second threaded portion
40, 41	first threaded portion
34, 34a, 34b	projection height adjusting means
Ra	adhesive

INTERNATIONAL SEARCH REPORT

 International application No.
PCT/JP99/01593

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁶ A61C7/08 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl ⁶ A61C7/08, A61C7/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-1999 Kokai Jitsuyo Shinan Koho 1971-1999 Jitsuyo Shinan Toroku Koho 1996-1999 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
EX	JP, 11-155884, A (Masakazu Uenishi, Shuhei Mizogami), 15 June, 1999 (15. 06. 99), Full text ; Figs. 1 to 12 (Family: none)	1, 5
X	US, 4505672, A (Craven H. Kurz), 19 March, 1985 (19. 03. 85), Full text ; Figs. 1, 2 (Family: none)	1
X	US, 4376628, A (B. V. Gaba), 15 March, 1983 (15. 03. 83), Full text ; Figs. 1 to 4 & EP, 28237, A1 & WO, 80/02368, A1 & NL, 7903648, A	1
A	JP, 3-21235, A (Earl Olaf Bergersen), 30 January, 1991 (30. 01. 91), Full text ; Figs. 1 to 8 & US, 4898535, A & EP, 337201, A1	1-5
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 30 June, 1999 (30. 06. 99)		Date of mailing of the international search report 13 July, 1999 (13. 07. 99)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.		Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)